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(71) Applicant
Fruehauf Corporation (USA-Michigan),
10900 Harper Avenue, Detroit, Michigan 48232, United
States of America

(72) Inventors
John W Harper
John P Schaurte

(74) Agent and/or Address for Service
Abel & Imray,
Northumberland House, 303-306 High Holborn, London
WC1V 7LH

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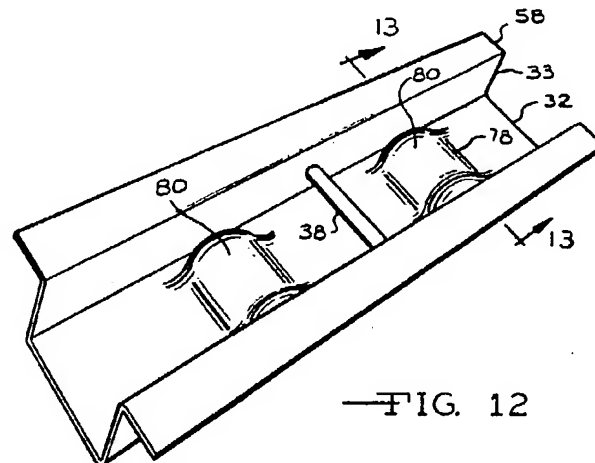
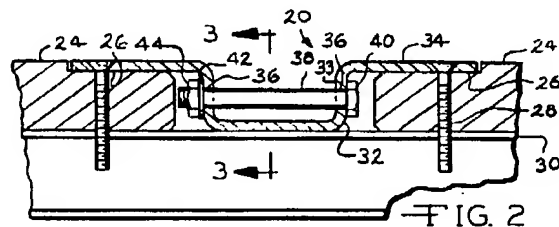
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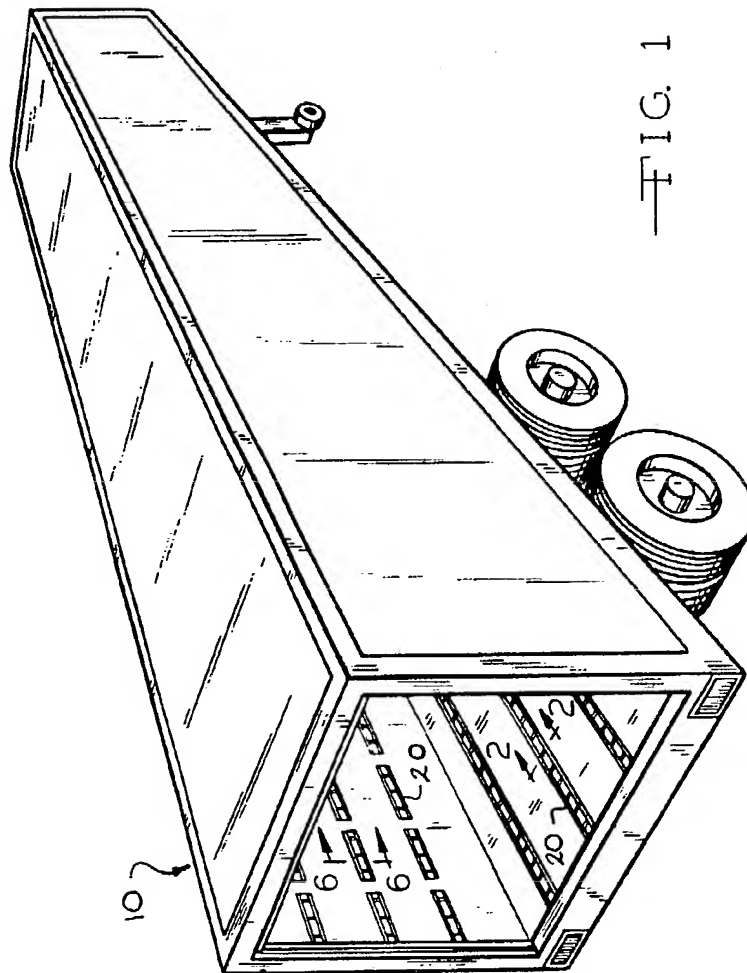
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(54) Cargo tie-down device

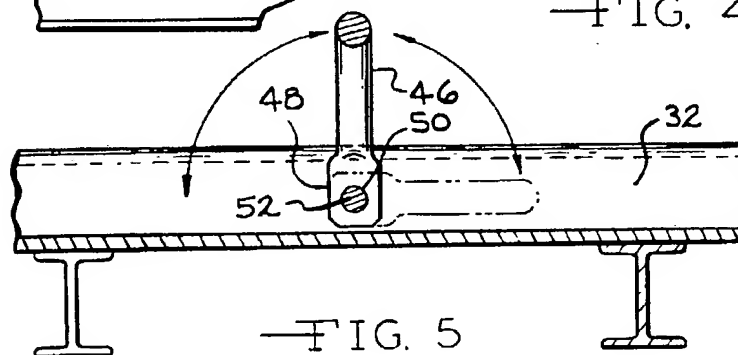
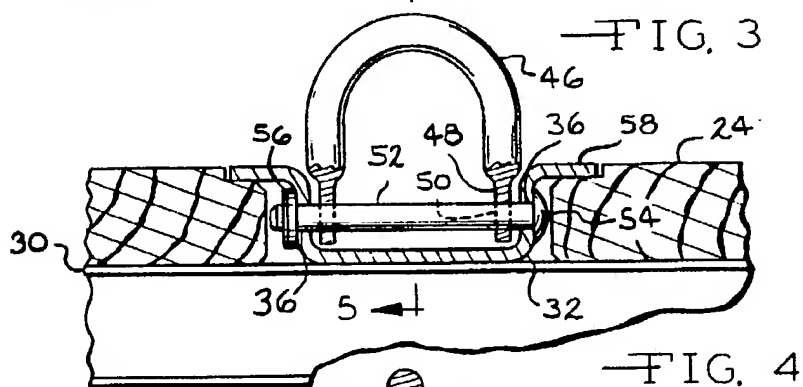
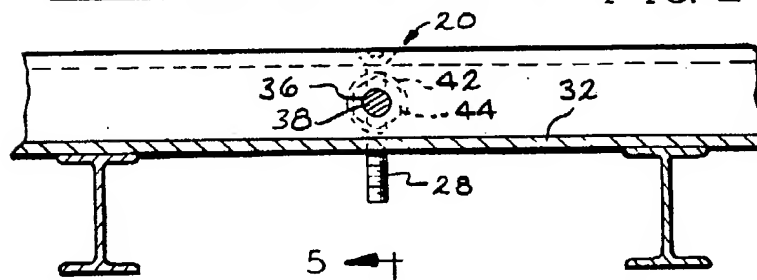
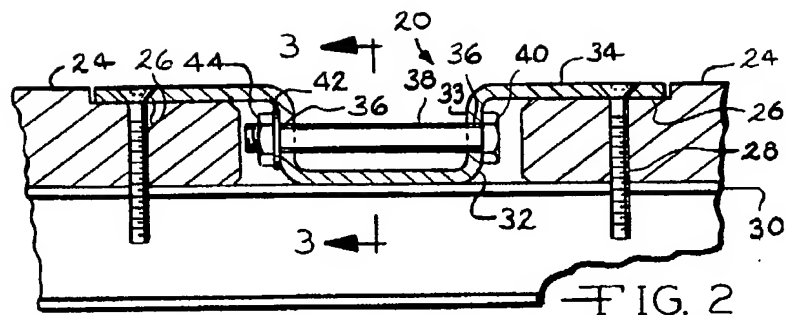
(57) A tie-down device for use in a cargo carrying unit in e.g. aircraft, ships, trains or lorries comprises a channel (32) recessed into an inner panel (24) of the cargo unit and an attachment means, e.g. rod (38), which engages the side walls of the channel to enable the attachment of a rope, cable or like. The channel (32) may have a V or semi-circular cross-section. A U-member may be freely pivoted to the rod (38) or the attachment means may be in the form of a U- or Z- member welded inside the channel. A well may be formed in the channel (32) directly below the rod member (38) to facilitate the use of large hooks or other mechanical grasping devices in conjunction with the tie-down device. In addition or instead guides (78, Fig. 12) may be formed in the channel (32) to facilitate placement of ropes, cables or the like.

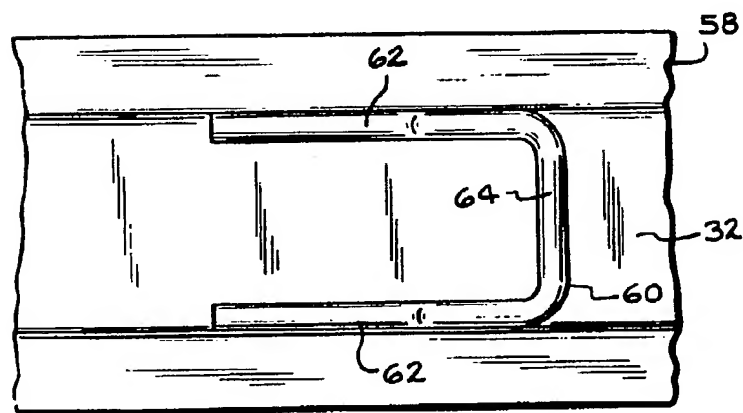
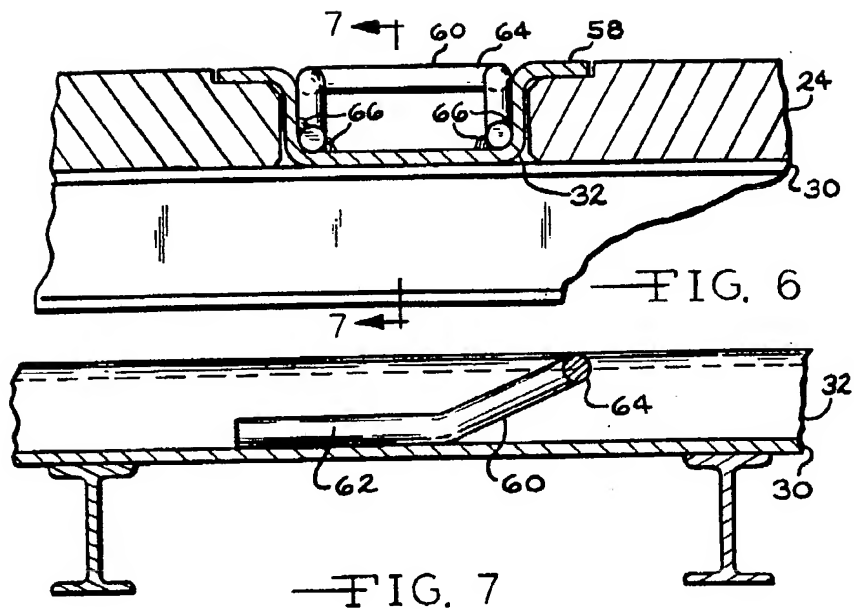


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—FIG. 8

FIG. 9

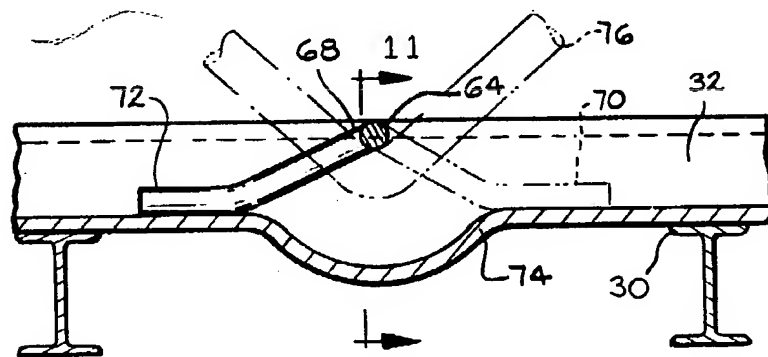
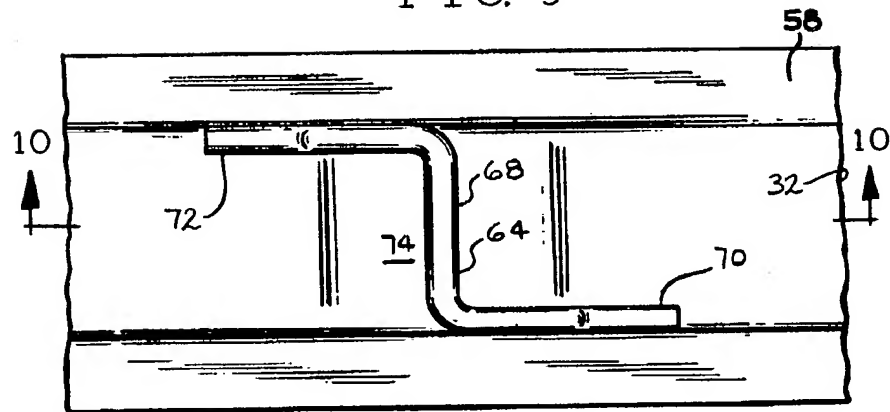


FIG. 10

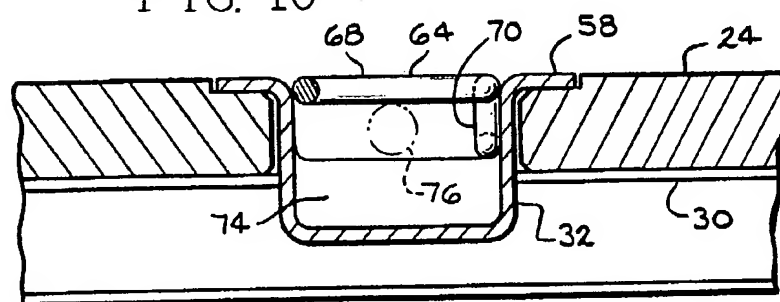


FIG. 11

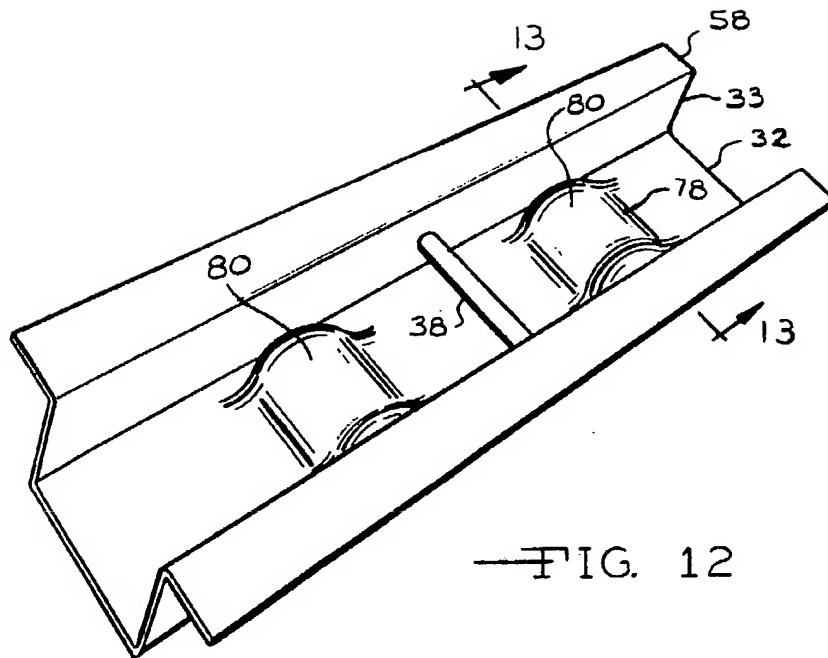


FIG. 12

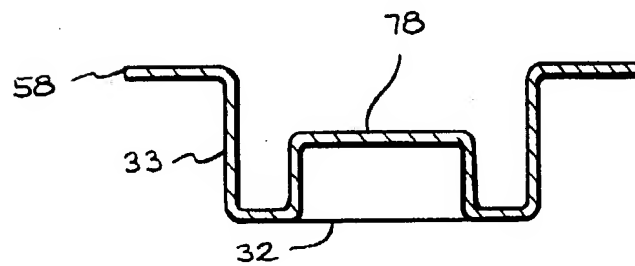


FIG. 13

SPECIFICATION

Cargo tie-down device

- 5 The present invention relates to a tie-down device used to provide a point of attachment for a strap, belt, cable, chain or the like at a selected location along a fixed channel or track. Such tie-down devices are useful in connection with modular cargo containers or cargo holding areas in aircraft, ships, trains, lorries, and other transport vehicles.
- 10 Cargo is frequently transported in containers or pallets to facilitate loading, unloading and constraining cargo. During shipment, it is important that the cargo should not shift from a fixed position. Such shifting can cause damage to the cargo itself or to the cargo container or can redistribute the cargo weight in a transport vehicle so as to affect vehicle stability adversely.
- 15 Numerous systems or apparatuses have devised to secure cargo in a fixed position during shipment. Among these devices is a retractable hook, located in a channel in the floor or wall of a cargo container or a cargo transport vehicle, which can be operated by a lever to place the hook in either a cargo holding or a retracted position. One such device is shown in the U.S. Patent No. 4,349,302 to Ferguson. One problem with the retractable hook devices is the relatively high cost of manufacturing them due to the number and complexity of their component parts. Another disadvantage is that the hooks can secure only cargo which fits within the grasp of the hook. This either requires special packaging of the cargo or severely limits the kinds of cargo which can be secured within a given cargo container or vehicle.
- 20 Another kind of cargo securing device is known as a snubbing block. The block fits within a channel located in the side or floor of a cargo container or a cargo vehicle. Such blocks are typically held in place in the channel by means of friction between the block and the sides of the channel. One design of a snubbing block is shown in U.S. Patent No. 4,311,420 to Hendricks et al. Like the retractable hook devices, the snubbing block devices are relatively expensive to manufacture. Additionally, snubbing blocks are not permanently attached to the cargo container or cargo vehicle and may be lost or misplaced when not in use to secure cargo in place.
- 25 Another approach to securing cargo is a block movable within a channel or track which may be locked into place at one of a plurality of selected positions. The block has a ring upon it through which a rope or cable may be passed. One such device is shown by the U.S. Patent No. 2,743,684 to Elsner. As with the previously mentioned devices the locking block with a ring is a relatively costly means of constructing a tie-down device. Further, the

block and ring of such devices extend through the plane of the loading surface into the cargo space and thus interfere with the placement of cargo on that surface.

- 70 The invention provides a tie-down device for use in a cargo-carrying unit, which comprises a channel and a rod member attached to the channel.

- The invention also provides a cargo-holding unit having at least one surface to which in use cargo may be secured, and at least one track means recessed within the surface, the track means including side wall means extending into the said surface and attachment means engaging the side wall means for attaching cargo restraint means thereto.

- 80 It is possible with a device constructed in accordance with the present invention to solve many of the problems encountered in using previous tie-down devices. Its component parts can be fewer and simpler, thus reducing the cost of construction. It can be used to secure cargo of any configuration and need not extend through the plane of the loading surface into the cargo space.

- 90 It is possible in accordance with the invention to provide a cargo tie-down device for use in cargo carrying units that is relatively inexpensive to manufacture and requires little or no maintenance, and that may be used in cargo-carrying units to secure cargo items of any size or configuration within the capacity of the cargo-carrying unit.

- 100 Preferably, the device does not protrude beyond the floor, side wall or ceiling panel of a cargo-carrying unit into the cargo area.

- Advantageously, the tie-down device guides rope or cable ends through the device for ease of attachment of ropes and cables to the device.

- 105 Various forms of tie-down device constructed in accordance with the present invention and a cargo-carrying unit fitted with such devices, will now be described by way of example only with reference to the accompanying drawings, in which:

- 110 Figure 1 is a perspective view of a cargo-carrying unit in the form of a semi-trailer of an articulated lorry showing the tie-down devices on the floor and inner side wall thereof;

- 115 Figure 2 is a fragmentary cross-section taken along the line 2-2 of Figure 1 and, when rotated clockwise through 90°, a fragmentary cross-section taken along the line 6-6 of Figure 1, showing a first form of tie-down device;

- Figure 3 is a section taken along the line 3-3 of Figure 2;

- Figure 4 is a view similar to Figure 2 showing a second form of tie-down device;

- Figure 5 is a section taken along the line 5-5 of Figure 4;

- Figure 6 is a view similar to Figure 2 showing a third form of tie-down device;

- 120 Figure 7 is a section taken along the line 7-

7 of Figure 6;

Figure 8 is a top plan view of the third form of device as shown in Figure 6;

Figure 9 is a view similar to Figure 8 showing a fourth form of tie-down device;

Figure 10 is a view similar to Figure 3 showing the fourth form of device;

Figure 11 is a section taken along the line 11-11 of Figure 10;

Figure 12 is a perspective view of a fifth form of tie-down device; and

Figure 13 is a cross section taken along the line 13-13 of Figure 12.

Referring to the accompanying drawings, and initially to Figure 1, a cargo-holding unit indicated generally by the reference numeral 10 in the form of a semi-trailer of an articulated lorry has tie-down devices 20 located in the floor and inner walls of the unit. A tie-down device 20 may be located not only in such a semi-trailer, but also in a modular cargo container, a railway goods wagon, a hold of a ship or air vehicle, or any other cargo storage container. The tie-down device 20 may be placed parallel to the longitudinal axis of the cargo-holding unit 10 as shown, or at any angle relative to a selected axis, including a 90° angle. Tie-down devices 20 need not be placed parallel to each other and do not need to be of any particular minimum length. The tie-down device 20 may be located on any interior panel of a cargo carrying unit, including floor panels, side wall panels, rear wall panels, front wall panels, ceiling panels and door panels. The panels need not be flat but may be curved or may have any appropriate configuration. The length and number of such tie-down devices 10 in a continuous line and the space between such devices 40 may be varied to meet the design requirements of a given cargo-carrying unit 10. Such a design requirement could be, for example, the need to avoid interference between the tie-down devices and support columns, posts, braces or other structural components of the cargo-holding unit.

Referring now to Figure 2, the first form of tie-down device 20 is mounted on shoulders 26 of support panels 24 so that no part of the tie-down device 20 projects beyond the plane defined by the top surface of the support panels 24. This arrangement substantially prevents the tie-down device 20 from interfering with the movement of cargo within the cargo-carrying unit 10. Bolts 28 or other attachment means may be used to fix the tie-down device 20 to the support panels 24 and to a base panel 30, which will normally be part of a cross-member or a similar structural component of the cargo-holding unit 10. The tie-down device 20 is shown with a cross-sectionally U-shaped channel 32, side walls 33 and flanges, the channel having in its side walls 33 channel holes 36 to accommodate a rod member 38 which passes through

the channel holes. It will be appreciated that the channel 32 may be of any suitable cross-sectional shape desired, including a "V" configuration or a semicircular configuration. The flanges 34 rest on the shoulders 26 so that the top of the flanges is essentially in the same plane as the top of the support panels 24. The rod member 38 may be held in place by a hexagonal head 40 at one end of the rod member and by a washer 42 and a nut 44 secured to a threaded portion at the other end. The rod member 38 is held in place below the level of the flanges 34. The rod member 38 may also be held in place by welding or other conventional means of attachment. Further, the tie-down device 20 may be fastened to the cargo-carrying unit 10 by any suitable conventional means, such as adhesives, welding, or mechanical fasteners.

The tie-down device 20 is used by fastening one end of a rope, cable or the like to it and securing the other end to the cargo or some advantageous point. The tie-down device 20 will also accommodate hooks, clips and the like attached to the ends of ropes or cables. Any desired number of rod members 38 may be placed in each of a selected number of channels on a given panel of a cargo-carrying unit 10, thus allowing cargo of almost any size or shape to be tied down within the cargo-carrying unit 10.

Referring to Figures 4 and 5, the second form of tie-down device comprises a free U member 46 having flattened ends 48 defining end holes 50. A holder rod 52 is placed through the channel holes 36 and the end holes 50, mounting the free U member 46 rotatably within channel 32. The holder rod 52 is held in place relative to the channel 32 at the channel holes 36 by a round head 54 on one end of holder rod 52 and a retainer ring 56 on the other end. The second form of device also has lips 58 in place of the flanges 34 of the first form of device. In operation, the free U member 46 lies within the channel 32 until used, there being no part of the free U member then extending above the plane defined by the top of the support panels 24 and the upper surface of the lips 58. When in use, the free U member 46 is placed in an upright position, as shown in Figure 5, to facilitate the attachment or passage of robes and cables or the attachment of hooks and clips.

Referring to Figures 6 to 8, the third form of tie-down device comprises a fixed U member 60 having parallel legs 62 each of which is bent at an angle as best shown in Figure 7. A cross-bar 64, which connects the parallel legs 62, has its uppermost portion substantially tangential to the notional plane defined by the upper surface of the lips 58 and the top surface of the support panels 24. The lower portions of the parallel legs 62 rest flat on the bottom of the channel 32 and may be welded thereto as shown by welds 66, while

upper portions of the parallel legs extend obliquely from the lower portions to the ends of the cross bar 64.

- Referring to Figures 9 to 11, the fourth form of tie-down device comprises a generally Z-shaped member 68 with a cross bar 64 connecting a forward leg 70 and a rear leg 72, each of which has a bent shape similar to one of the parallel legs 62 of the third form of device. The forward leg 70 and the rear leg 72 extend in opposite directions from each other along the length of the channel 32, on opposite sides of the channel, as is best shown in Figures 9 and 11. Again, the cross bar 64 has its uppermost portion in the same plane as the upper surface of the lips 58 and the top surface of the support panels 24. As is best seen from Figure 10, a well 74 may be formed in the portion of channel 32 under the cross bar 64 to facilitate the passage of large-diameter ropes or cables and to accommodate large hooks, clips or the like. One means of placing the well 74 in the channel 32 is by stamping the desired depression directly into the channel. A well 74 may be placed in the channel 32 in any of the other forms of tie-down device described herein.
- Referring now to Figures 12 and 13, the fifth form of tie-down device has a rod member 38 similar to that of the first form of device but comprises guides 78 located as shown in the channel 32 either side of the rod member. Rope or cable ends fed into the channel 32 under the rod member 38 will contact angled surfaces 80 of the guides 78 and be deflected upwards out of the channel 32. That will assist a person to obtain a grasp on the rope or cable end as it comes out of the channel 32. The guides 78 may be formed in the channel 32 by pressing, stamping or by any suitable known metal formation method. In certain instances it may be desirable to form the guides 78 in such a manner that their tops are in the plane defined by the top of the lips 58.

CLAIMS

1. A tie-down device for use in a cargo-carrying unit, which comprises a channel and a rod member attached to the channel.
2. A device as claimed in claim 1, wherein the rod member extends across the channel and is attached to the wall of the channel at both ends.
3. A device as claimed in claim 1 or claim 2, wherein no part of the rod member extends beyond a notional plane tangent to the channel on both sides of the channel.
4. A device as claimed in any one of claims 1 to 3, comprising support panels between which the channel is located.
5. A device as claimed in claim 4, no part of which extends beyond a notional plane defined by the top surfaces of the support panels.

6. A device as claimed in any one of claims 1 to 5, comprising a well formed in a portion of the channel under the rod member.

7. A device as claimed in any one of claims 1 to 6, comprising means for attaching the device to a cargo-carrying unit.

8. A tie-down device substantially as hereinbefore described with reference to, and as shown in, Figures 2 and 3, or Figures 4 and 5, or Figures 6 to 8, or Figures 9 to 11, or Figures 12 and 13 of the accompanying drawings.

9. A cargo-carrying unit having at least one tie-down device as claimed in any one of claims 1 to 8 recessed into at least one surface of the unit to which in use cargo may be secured.

10. A cargo-holding unit having at least one surface to which in use cargo may be secured, and at least one track means recessed within the surface, the track means including side wall means extending into the said surface and attachment means engaging the side wall means for attaching cargo restraint means thereto.

11. A unit as claimed in claim 10, comprising guide means located in the track means between the side wall means.

12. A unit as claimed in any one of claims 9 to 11, which is a modular cargo container.

13. A unit as claimed in any one of claims 9 to 11, which is a semi-trailer.

14. A unit as claimed in claim 13, which is a platform semi-trailer.

15. A cargo-carrying unit substantially as hereinbefore described with reference to, and as shown in, Figures 1 to 3 of the accompanying drawings.

16. A unit as claimed in claim 15, modified substantially as hereinbefore described with reference to, and as shown in, Figures 4 and 5, or Figures 6 to 8, or Figures 9 to 11, or Figures 12 and 13, of the accompanying drawings.

17. A set of parts for a tie-down device as claimed in any one of claims 1 to 8 or for a unit as claimed in any one of claims 9 to 16.

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